

# Seasonal Occurrence of *Anodonta cataracta* Say, 1817, Glochidia on Three-spined Sticklebacks, *Gasterosteus aculeatus* Linnaeus

by

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**Abstract:** Glochidia of *Anodonta cataracta* were recovered from three-spined sticklebacks, *Gasterosteus aculeatus*, caught in Ocean Pond, Newfoundland, Canada. A marked seasonal cycle of prevalence and intensity of infestation was noted, with both parameters being highest in the winter. No differences were noted between infestation and weight and sex of the host. The majority of glochidia were located on the gills and fins.

## INTRODUCTION

THE SPECIES and distribution of filter-feeding unionid clams in Newfoundland, Canada, are poorly known. Indeed the molluscan fauna of the Province, other than commercially important marine species, has received little attention during recent years. The major works on this region are those of VANATTA (1925, 1927, 1930), BROOKS & BROOKS (1940) and LA ROCQUE (1953, 1961). CLARKE & RICK (1964) discussed the status of *Anodonta brooksiana* van der Schalie, 1938, and placed it in synonymy with the polymorphic species *Anodonta cataracta* Say, 1817. The life cycle of the unionid clams usually involves a free-living adult form, with a short-lived parasitic larval (glochidial) phase (COKER *et al.*, 1922). KAT (1984) recently reviewed parasitism within the Unionacea (Bivalvia). During a study of the metazoan parasites of three-spined sticklebacks (*Gasterosteus aculeatus* Linnaeus, 1758) in Newfoundland, glochidia were frequently found. This note reports the occurrence and intensity of infestation with glochidia on *G. aculeatus*.

## MATERIALS AND METHODS

A total of 615 three-spined sticklebacks was caught at two sample sites in Newfoundland, Canada (Ocean Pond [OP]—47°25'N, 53°27'W—428 fish; Great Pond [GP]—47°40'N, 52°46'W—187 fish), using minnow traps and dip nets. The sampling periods, during which attempts were made to catch 20 fish per month, extended from November 1970 to December 1972 (OP) and October 1971 to December 1972 (GP). Occasional samples were

also taken in late summer, fall, and winter of 1974, 1976, 1978, 1980, and 1982. Winter weather conditions (temperatures to -20°C, combined with 60-80 km/h winds, ice cover up to 60 cm, and unplowed roads) made acquisition of the desired sample size difficult on occasion. Fish were transported back to the laboratory alive, and necropsied within 48 h using conventional techniques (FERNANDO *et al.*, 1972). Fish were weighed to the nearest g and measured to the nearest mm prior to necropsy. Glochidia found were treated as outlined in FERNANDO *et al.* (1972). Parasitological terminology is that recommended by MARGOLIS *et al.* (1982).

## Sample Sites

As glochidia were recovered only from fish taken in Ocean Pond, only this sample site will be described. The morphometry of Ocean Pond and its physicochemical characteristics were well described by SEABROOK (1962) and JAMIESON (1974). It is a large shallow lake, with a mean length of 5.50 km and mean width of 0.55 km. The total area is approximately 328 ha, with a maximum depth of 9.75 m and a mean of 4.54 m. The lake has a much-indented shoreline and contains 30 islands. The north end of the lake, where sampling occurred, has a bottom covered with large boulders and up to 2.44 m of gray mud.

## RESULTS AND DISCUSSION

Data will be analyzed and discussed with regard to prevalence and intensity of infestation, relationship of infestation to fish size (weight and length), and distribution of

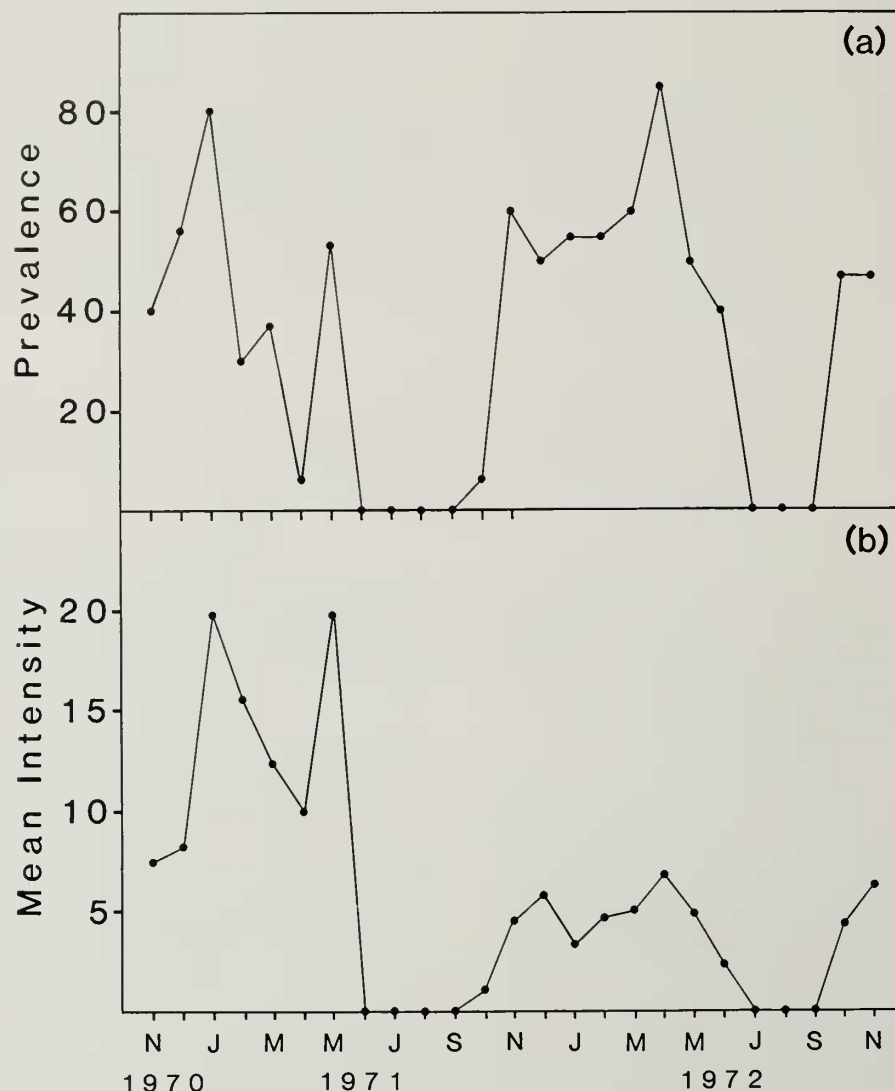


Figure 1

a. Monthly prevalence of glochidia on *Gasterosteus aculeatus*. b. Mean number of parasites per infested host (intensity) for each monthly sample.

the glochidia on the host body. DARTNALL & WALKEY (1979) used a similar scheme in their report on the distribution of *Anodonta cygnea* on *Gasterosteus aculeatus* in England. The present parasites were identified as *A. cataracta* on the basis of glochidial morphology and measurements that approximated those given by WILES (1975). This identification was confirmed by examination of shells of adults collected from the pond. (No glochidia or adults were recovered from Great Pond.) A total of 148 fish (35%) was infested with glochidia (mean number per infested fish  $7.5 \pm 7.5$ , range 1-40). Monthly variation in prevalence is shown in Figure 1(a), with a marked sea-

sonal cycle being evident. No glochidia were found in the periods June-September 1971 and July-September 1972. The number of infested fish then rose to a peak in January 1971 and April 1972 respectively. The number of fish infested with glochidia in April 1971 was much lower than in April 1972 for uncertain reasons. Since 1972 no glochidia have ever been found on a fish in the July-September period and prevalence has been within 5% of the figures given for 1972 for fish collected in other months and years. The mean intensity of infection (Figure 1(b)) was higher in the period December 1970-May 1971 than it was at any other time during the survey period. The

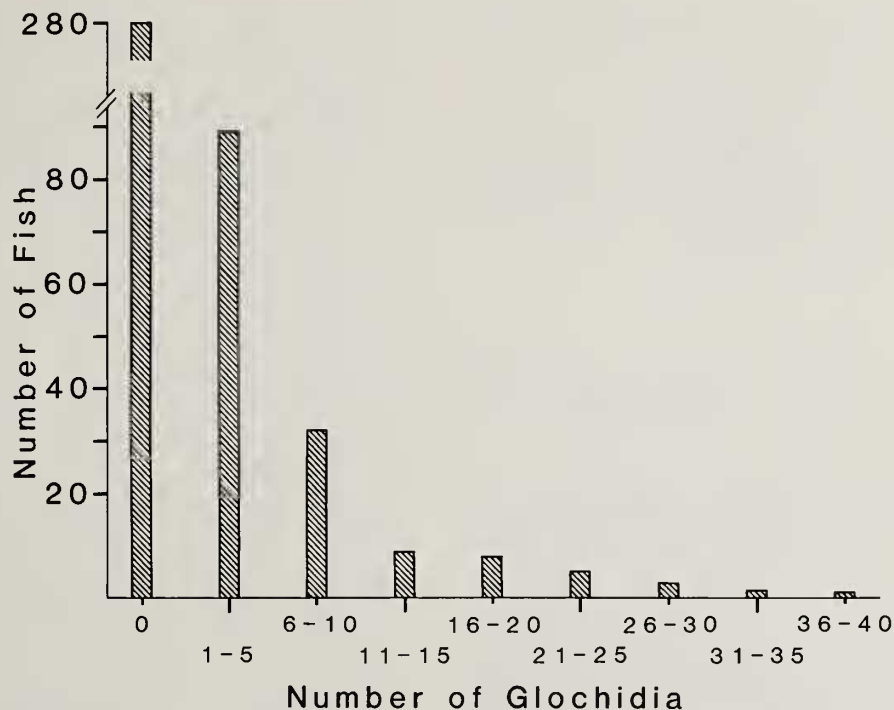


Figure 2

Frequency distribution showing the burdens of glochidia on *Gasterosteus aculeatus*.

mean intensity since 1972 has approximated that noted during 1972. Unlike the findings of DARTNALL & WALKEY (1979) no significant differences were noted in the prevalence and intensity of infection in relation to length of the host. Moreover, no differences were noted when weight and sex of the host were considered (85 females [37.8%], 58 males [29.4%] infected; mean number glochidia/infected female 8.8, male 5.7).

The distribution of glochidial burdens within the fish population was overdispersed (Figure 2). The majority of hosts (280, 65%) were uninfested, and a few members of the host population (18, 4%) were host to a large proportion of the total parasite population (448 glochidia; 43% of total number of glochidia recovered). Such a distribution is typical of many parasites (ANDERSON, 1978).

Glochidia were found most frequently on the gills (71% of cases where exact location was recorded), with 21% being found on the fins. Four percent were located in the mouth and 4% on the opercula. This situation is unlike that noted by DARTNALL & WALKEY (1979) and by DUDGEON & MORTON (1984), who found the fins to be most heavily infested, but similar to that reported by WILES (1975), who found only gills infested. Of the glochidia on the fins, some 80% were taken from the pectorals. In only two cases were glochidia found on the fins in the absence of glochidia on the gills. The fins were usually

not infested unless large numbers (>30) of glochidia were found on the fish. A single glochidium was found in the stomach of one fish. No evidence of previous infestation was noted on the body of uninfested fish, and no pathological conditions were observed in infested fish. Each glochidium was enclosed in a cyst of host origin which was composed of host epidermal cells and other neighboring cells that had moved into the region.

This parasite has previously been recovered in Canada from *Catostomus commersoni* by WILES (1975). In the present study a marked host-specificity was noted with only one glochidium being located on 31 specimens of *Salmo salar* (landlocked) and one on 31 *Salvelinus fontinalis* taken from Ocean Pond in September–November 1972. None was recovered from 10 specimens of *Pungitius pungitius* taken in December 1970–May 1971.

Data collected in this study confirm WILES' (1975) suggestion that *Anodonta cataracta* is a winter breeder in the Atlantic region of Canada. It is also of interest to note that DARTNALL & WALKEY (1979) found glochidia on fish only when the temperature was below 12°C.

The glochidial population in Ocean Pond has remained relatively stable over the past decade, with regular cycles in prevalence and numbers of glochidia being noted. However, further monitoring would be worthwhile as summer residences are being built along the shoreline. The con-

struction and use of these structures may well alter the physicochemical parameters of the lake waters, causing changes in the populations of *Anodonta*.

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